STATE OF CALIFORNIA

Energy Resources Conservation and Development Commission

In the Matter of: The Application for Certification for the Three Mountain Power Project	Docket No. 99-AFC-2

CURE RESPONSE TO MOTIONS OF BURNEY RESOURCE GROUP AND CLAUDE EVANS

December 15, 1999

Marc D. Joseph
Lizanne Reynolds
Adams Broadwell Joseph & Cardozo
651 Gateway Boulevard, Suite 900
South San Francisco, CA 94080
(650) 589-1660 Voice
(650) 589-5062 Facsimile
lr@adamsbroadwell.com

INTRODUCTION

CURE files this response to the motions of the Burney Resource Group ("BRG") and Claude Evans ("Evans") pursuant to the Committee's November 19, 1999 Notice of Committee Status Conference and Hearing on Motions.

CURE supports the motions. Without the additional information requested by the petitions, the CEC will not be able to adequately assess the Project's potentially significant environmental impacts or know whether the proposed mitigation for these impacts would mitigate impacts to less than significant levels.

DISCUSSION

I. BRG Motion for 5-year Water Study

The driving force behind BRG's motion for a 5-year water study is BRG's concern that there is not enough information about the groundwater system from which the Project would pump and into which its wastewater would seep to adequately assess the Project's impacts. CURE agrees with BRG that there is not enough data.

The Burney Water District ("BWD") would supply the Project with 3,500 acre-feet/year of groundwater. (PSA, p. 57; *see also* Fox Declaration, Comment I.A.) Currently, BWD pumps a total of 1,300 acre-feet/year to supply its existing customers. (AFC, p. 1-4.) Thus, the Project would increase the amount of water pumped from the local aquifer(s) by 269%. The Project also proposes to discharge its wastewater into unlined percolation ponds. (PSA, p. 59.)

Such a dramatic increase in pumping from the basin could adversely affect nearby wells, the flow in Burney Creek, and the discharge from local springs, including Burney Falls. (Fox Declaration, Comment I.A.) At this point, there simply is not enough information to determine how the Project's water use and wastewater disposal will impact Burney's groundwater resources. (*Ibid*.; *see also* PSA, pp. 66-68.)

To adequately evaluate the Project's impacts to water resources, the following additional information is needed:

- aquifer properties (*e.g.*, storage capacity, hydraulic conductivity, porosity, anisotropy)
- aquifer geometry (*e.g.*, saturated thickness, layering)
- characteristics of nearby wells (*e.g.*, location, screened interval, pumping rates, water levels (including seasonal variations))
- existing water quality both upgradient and downgradient of the Project site (Fox Declaration, Comment I.)

For a more detailed discussion of these issues, please review the attached declaration of Dr.Fox.

CEQA[1] and the Warren-Alquist Act[2] require the Commission to analyze all of the Project's potentially significant impacts and impose all feasible mitigation for these impacts prior to Project certification. (Pub. Res. Code §§ 21002, 21081, 25519(c); *see also* Cal. Code Reg., Title 20, §§ 1741(b)(1), 1748.)

[1] California Environmental Quality Act ("CEQA"), Pub. Res. Code § 21000 *et seq.*
[2] Warren-Alquist State Energy Resources Conservation and Development Act, Pub. Res. Code § 25000 *et seq.*

Without the additional information identified above, the CEC will not be able to adequately assess the Project's potentially significant environmental impacts or have a reasonable basis for concluding that these impacts will be mitigated to less than significant levels. Thus, the requested information is needed for the CEC to fulfill its legal obligations.

II. Evans Motion for 5-year Water Study

For the reasons discussed above under part I of this response, CURE also supports Mr. Evans' motion for a 5-year water study.

III. BRG Motion for 1-year Air Study

In short, BRG requests a 1-year air study of ambient air quality and meteorological data on the basis that the existing data is inadequate and does not provide the CEC with a sufficient basis for evaluating the Project's impacts to air quality and public health. CURE agrees with BRG.

Burney sits in a valley surrounded by high peaks. (Fox Declaration, Comment II.A.3.) Due to its topography, Burney experiences stagnant air conditions (inversions) that trap pollution in the valley. (*Ibid*.; PSA, pp. 7, 17) Thus, it is difficult to extrapolate meteorological and ambient air quality data from other areas that are not similarly situated to Burney.[3]

Meteorological ("met") data is a key input for analyzing the Project's impacts to air quality and public health. For example, wind speed

[3] Dr. Fox also spoke with the individuals cited in the letter from Shasta County Air Quality Management District to substantiate the representativeness of the met station

greatly influences the dispersion of air pollutants, including toxics emissions. (Fox Declaration, Comment II.A.) Higher wind speeds cause greater dispersion and thus lower ambient concentrations of pollutants. (*Ibid*.)

Meteorological data is such an important component of an air quality analysis that the U.S. EPA has published several guidance documents on the subject.[4] The met data the Applicant is relying on falls far short of these guidelines.

The Applicant is proposing to use met data gathered from the side of a mountain. (*Id*., Comment II.A.3.) Wind speeds along mountain sides are substantially greater than in valleys. (*Ibid*.) EPA Guidance expressly states that, where a Project would be located in a valley, the meteorological data should be collected from within the valley and not on a nearby hilltop. (*See* Fox Declaration, Comment II.A.3.)

There are other, equally serious problems with the Applicant's met data that cause it to be wholly inadequate according to EPA guidance. One of these deficiencies is that the station only gathers data for ten minutes of each hour (*i.e*., 17%). EPA guidance establishes a minimum acceptable data capture rate of 90%. (Fox Declaration, Comment II.A.5.) The attached declaration of Dr. Fox explains in detail why the Soldier

---

data. These individuals subsequently revised their opinions once the requirements of dispersion modeling were explained to them.

[4] *E.g*., U.S. EPA, On-Site Meteorological Program Guidance for Regulatory Modeling Applications, June, 1987; U.S. EPA, Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD), May, 1987 (containing guidance regarding meterological data collection); U.S. EPA, New Source Review Workshop Manual. Prevention of Significant Deterioration and Nonattainment Area Permitting, Draft, October 1990 (same).

Mountain[5] met station data is not adequate for analyzing the Project's impacts. (Fox Declaration, Comment II.A.)

Based on Dr. Fox's analysis, CURE supports BRG's motion to require the Applicant to collect 1 year of on-site meteorological data. The types of data that should be collected are set forth in Comment II.B. of Dr. Fox's declaration.

IV. Evans Motion for Particulate Mitigation

CURE generally supports the paving/treatment of roads to offset particulate emissions. However, it is important that emission reductions from road paving be accurately assessed. This requires accurate data about each road's composition (*e.g.*, silt content), frequency of use (*e.g.*, daily trips), and what effect meteorological (*e.g.*, snow, ice) or other conditions have on the amount of particulate emissions generated by use of the road.

Regarding road treatments other than paving, there must be a mechanism in place to ensure that these treatments are applied as frequently as needed to ensure continued emission reduction. In other words, the emission reductions must be permanent and enforceable.

Unlike Mr. Evans, CURE is not familiar with the specific road segments addressed in the motion. Nor do we have the kind of data (described in the preceding paragraph) needed to determine whether paving/treating these roadways would, in fact, result in the required

[5] The Soldier Mountain met station was moved to Brush Mountain some time ago, but is still referred to as the Soldier Mountain met station. (Fox Declaration, Comment II.A.)

emission reductions. Thus, CURE cannot take a position on whether paving these particular roadways would provide adequate mitigation for the Project's particulate emissions.

CONCLUSION

CURE supports the motions for the reasons discussed above. The requested data is needed for the CEC to fulfill its legal obligations under CEQA and the Warren-Alquist Act, which require it to thoroughly analyze and mitigate, if feasible, all of the Project's potentially significant impacts. CURE therefore respectfully requests that the Committee grant the BRG and Evans motions.

Dated: December 14, 1999 Respectfully submitted,

Marc D. Joseph
Lizanne Reynolds
Adams Broadwell Joseph & Cardozo
651 Gateway Boulevard, Suite 900
South San Francisco, CA 94080
(650) 589-1660 Voice
(650) 589-5062 Facsimile
lr@adamsbroadwell.com

STATE OF CALIFORNIA

Energy Resources Conservation and Development Commission

In the Matter of: The Application for Certification for the Three Mountain Power Project	Docket No. 99-AFC-2

TESTIMONY OF J. PHYLLIS FOX ON BEHALF OF THE CALIFORNIA UNIONS FOR RELIABLE ENERGY

December 15, 1999

Marc D. Joseph
Lizanne Reynolds
Adams Broadwell Joseph & Cardozo
651 Gateway Boulevard, Suite 900
South San Francisco, CA 94080
(650) 589-1660 Voice
(650) 589-5062 Facsimile
kpoole@adamsbroadwell.com

Attorneys for Intervenor
CALIFORNIA UNIONS FOR
RELIABLE ENERGY

I, J. Phyllis Fox, declare as follows:

I am a principal in the firm of Environmental Management. I have a Ph.D. in environmental engineering from the University of California at Berkeley with minors in hydrology and mathematics. I have over 28 years of experience in environmental engineering and have evaluated the air quality and water-related impacts of hundreds of industrial facilities throughout California, including over 20 power plants. My qualifications are more fully described in Exhibit 1.

I have been working for the California Unions for Reliable Energy ("CURE") as a consultant on the Application for Certification ("AFC") for the Three Mountain Power Project ("Project" or "TMPP") since the data adequacy phase in April 1999. I have reviewed numerous documents and have conducted my own investigations and analyses regarding the Project's potential water and air quality impacts. I have participated in workshops sponsored by the California Energy Commission ("CEC") on these issues. I have also reviewed the motions of the Burney Resource Group ("BRG")[1] and Claude Evans ("Evans")[2] requesting a 5-year water study, a 1-year air study, and particulate mitigation.

My opinions regarding the need for preconstruction air and water monitoring, described below, are based on the activities described above and the knowledge and experience I have acquired during more than 28 years of working on environmental issues.

I. WATER

With regard to the need for preconstruction water studies, I have reviewed numerous documents, including the subject petitions, AFC,

---

[1] Motion by The Burney Resources Group in the Matter of Application for Certification for the Three Mountain Power Project, October 21, 1999 (water) and November 2, 1999 (air).

[2] Motion by Claude D. Evans in the Matter of Application for Certification for the Three Mountain Power Project, October 21, 1999 (water) and _____ (air).

TMPP's responses to staff and CURE data requests, the preliminary staff assessment ("PSA"),[3] three technical reports docketed by BRG on isotope hydrology of the area,[4] the Lawrence & Associates groundwater report ("L&A 4/19/99"),[5] the L&A Report of Waste Discharge ("L&A 10/7/99"),[6] and other materials cited below.

Based on my review of this information, I agree with petitioners that there is not adequate information to evaluate the Project's water-related impacts and that preconstruction monitoring is required to obtain the missing information. In the following sections, I discuss the basis for my opinion and propose a minimally acceptable preconstruction monitoring program.

I.A Missing Hydrologic And Water Quality Data

The Project proposes to pump 3.1 million gallons per day of water from two new wells and to dispose of 0.7 million gallons per day of wastewater in percolation ponds. The proposed pumping could adversely affect the yield of nearby wells, the flow in Burney Creek, and the discharge of local springs, including Burney Falls. Wastewater disposal in ponds could degrade the quality of local groundwater over a large area.

---

[3] California Energy Commission, Preliminary Staff Assessment, Soil & Water Resources, December 10, 1999.

[4] T.P. Rose, M.L. Davisson, and R.E. Criss, Isotope Hydrology of Voluminous Cold Springs in Fractured Rock from an Active Volcanic Region, Northeastern California, Journal of Hydrology, v. 179, 1996, pp. 207-236; T.P. Rose and M.L. Davisson, Radiocarbon in Hydrologic Systems Containing Dissolved Magmatic Carbon Dioxide, Science, v. 273, September 6, 1996, pp. 1367-1370; M.L. Davisson and T.P. Rose, Comparative Isotope Hydrology Study of Groundwater Sources and Transport in the Three Cascade Volcanoes of Northern California, Lawrence Livermore National Laboratory Report UCRL-ID-128424, September 1997.

[5] Lawrence & Associates, Ground-Water Resource Evaluation of the Burney Basin and Effects of Ground-Water Pumping and Wastewater Disposal from the Proposed Three Mountain Power Plant, Burney, Shasta County, California, Prepared for Burney Water District, April 19, 1999.

[6] Lawrence & Associates, Report of Waste Discharge: Hydraulic-Capacity and Ground-Water Quality Analyses for Discharge of Nondomestic Wastewater at the Three Mountain Power Plant Site, Prepared for Three Mountain Power, LLC, October 7, 1999.

The applicant concludes that these impacts would not be significant, based largely on a faulty water balance and sweeping generalizations based on inadequate data for the site. However, the isotope hydrology studies provided by BRG indicate that about 50 percent of the flow at Burney Falls originates outside of the basin[7] and that the flow of Burney Falls is substantially smaller (108,000 ac-ft/yr) than assumed by the applicant (132,000 ac-ft/yr). These results indicate that applicant's analyses have either substantially overestimated natural recharge[8] or underestimated current water use in the basin. This would overestimate the available supply and underestimate Project impacts, highlighting the problems with the scanty and inadequate available information.

A large amount of information is required to evaluate Project impacts, including aquifer properties, information on nearby wells, and existing groundwater quality. None of this information is currently available. In fact, the PSA concluded that "[s]taff does not have sufficient information at this time to reach any conclusions or make any recommendations, except to identify information that is still needed for staff to finish its analysis." (PSA 12/10/99, p. 66.) I agree with staff, who concluded that the following additional issues have to be investigated before the water-related impacts of the Project can be assessed and mitigated (PSA, pp. 66-68):

- drought-year water balance
- ability of local aquifer to supply Project water demand

---

[7] Lee Davisson, LLNL, indicated in conversations with me on November 10, 1999 that the fraction of the water at Burney Falls that originates outside of the Burney Basin could be estimated from a simple mixing model using oxygen and carbon isotope ratios as: fraction originating from Rising River = $(I_{\text{Burney Falls}} - I_{\text{Rising River}})/(I_{\text{Burney Creek}} - I_{\text{Rising River}})$, where I is the measured oxygen or carbon isotope ratios. Using the data in Rose et al. 1996, Table 1 and Davisson and Rose, September 1997, Table 1 for February 1995, about 50% of the water flowing over Burney Falls originates outside of Burney Basin.

[8] Lee Davisson believes, based on his investigations cited herein, that natural recharge in the area is about 50% of precipitation, while the applicant assumed that 87% was recharged. (L&A 4/19/99, Table 3.)

- impact of Project pumping on local wells
- impact of ponds on groundwater quality
- impact of ponds on quality of Project water supply and wastewater discharge
- baseline groundwater quality

The investigation of these issues requires certain basic data that currently does not exist and which can only be obtained through a preconstruction field monitoring program. The additional data that is required to analyze the Project's impacts includes:

- aquifer properties (storage capacity, hydraulic conductivity, porosity, anisotropy)
- aquifer geometry (saturated thickness, layering)
- location, screened interval, diameter, pumping rates, and water levels of nearby wells
- existing groundwater quality

I.A.1 Aquifer Properties

Aquifer properties are determined from a pump test that typically takes 24 hours to several days to complete. These properties are essential to determine whether the local aquifer can actually supply the Project, to determine whether Project pumping would interfere with nearby wells, to determine whether Project pumping would affect the flow in Burney Creek and Burney Falls, and to evaluate the impact of wastewater disposal on groundwater quality. A pump test has never been conducted to my knowledge anywhere within the Burney groundwater basin.

Staff suggests that the absence of aquifer properties can be addressed by making "worst-case" assumptions. (PSA, pp. 56-58, 60.) However, this is only realistic where a range of information is available from elsewhere within the same groundwater basin. When some existing information is available, one simply picks the values from within the

range that would yield the worst-case impact. Here, there is no information whatsoever and thus no basis for picking a worst-case value. Extrapolation from other highly fractured lava flow aquifers is not recommended because these systems are highly heterogeneous, and it is generally not possible to extrapolate from one area within the same geologic basin to another, let alone from a distinct geologic basin. Therefore, I believe that a pump test must be conducted at the site where the wells would be installed so that the impacts of the wells can be evaluated before they are installed.

I.A.2 Aquifer Geometry

Knowledge of aquifer geometry, including saturated thickness, location of discrete water-brearing zones, fractures, perched layers, etc., is essential to construct models that are used to estimate hydraulic and water quality impacts. Experience with the existing Burney Water District ponds, for example, indicates that during the winter, shallow perched water develops atop lower permeability basalt. (L&A 10/7/99, p. 2.) The presence of perched groundwater in the Project vicinity could substantially alter conclusions about water quality impacts.

A well drilling and logging program would be required to develop sufficient information to adequately characterize the aquifer geometry of the basin. Thus, I recommend that the four new wells that would be drilled for groundwater quality monitoring (section I.A.4) be logged to help describe aquifer geometry.

I.A.3 Nearby Wells

The Project could impact nearby wells within the zone of influence of the two proposed wells. The L&A hydrologic report determined that there are six wells of record within 3/4 miles of the proposed Project wells. (L&A 4/19/99, p. 18 and Appx. A.) However, the applicant failed to locate these wells or to provide most of the information that would be required to evaluate the impact of Project pumping on the wells, including current pumping rates, baseline water levels, and well

characteristics (e.g., screened interval, well diameter, well depth). All of this information is required to perform the well interference study recommended by staff (PSA, p. 58) and to assure that LORS are complied with after the project is operational.

This information can only be obtained through field work. Staff specifically recommended that the wells be located and baseline water levels determined. (PSA, p. 68.) I concur with this recommendation. In addition to locating the wells and determining baseline water levels, I further recomend that well depth, screened interval, diameter, discharge, and current use be determined for each existing well within a 1-mile radius of the Project's wellfield.

I.A.4 Groundwater Quality

Finally, the local aquifer is especially vulnerable to contamination because water percolates rapidly through fractured lava and thin overlying soils provide little or no protection. (PSA, p. 62.) There is very little reliable information on existing groundwater quality in the area where the wells would be drilled. Existing water quality information is required to estimate the composition of the wastewater that would be discharged to the ponds and to determine the impact of the pond discharge on downgradient groundwater quality. Existing water quality data (i.e., the baseline), including both interannual and seasonal variations, is essential to assure that the Project complies with LORS after it is built.

The very limited available groundwater quality information -- one sample for October 1998 from a Burney Mountain Power ("BMP") well, a 1998 composite for an unidentified Johnson Park well , and a single February 1992 sample from Burney Water District ("BWD") well 7 (L&A 4/19/99, Appx. C; AFC, Appx. J) -- is not sufficient to establish a statistically valid baseline against which future monitoring can be

compared.[9] Based on my experience, at least one year of monthly data collected at upgradient and downgradient wells is required to establish a baseline, particularly when the aquifer is highly susceptible to contamination and is the only source of drinking water for the entire region, such as this one.

Further, the limited available data indicate that there is a wide range in groundwater quality in the Burney Basin. For example, the BWD well has a total dissolved solids ("TDS") concentration of 76 mg/L, the BMP well has an average TDS of 126 mg/L, and the Johnson Park well has an average TDS of 220 mg/L. (PSA, p. 61.) The Johnson Park well also has elevated concentrations of manganese, lead and nitrate (L&A 4/19/99, Appx. C), suggesting local water quality is highly variable.

Staff concluded that the limited existing groundwater quality information is inadequate because detection limits were too high. (PSA, p. 61.) This means that even if contaminants were present (which would be concentrated in the cooling tower and discharged into the ponds), they would not have been detected because the measurement methods were not sensitive enough.

Staff recommended a monitoring study to determine existing preproject baseline groundwater quality and well water levels both upgradient and downgradient of the site and percolation ponds before the project is operational. (PSA, p. 68.) I concur with this recommendation.

I further recommend that baseline groundwater and water level monitoring occur at least monthly for at least one full year before the project is operational to capture seasonal variations. The program should monitor at least one new upgradient and three new downgradient

[9] Robert D. Gibbons, Statistical Methods for Groundwater Monitoring, John Wiley & Sons, Inc., New York, 1994; U.S. EPA, Statistical Training Course for Ground-Water Monitoring Data Analysis, Report EPA 530-R-93-003, April 1994; U.S. EPA, Statistical Analysis of Ground-Water Monitoring Data At RCRA Facilities, Interim Final Guidance, Report EPA 530-SW-89-026, April 1989.

wells for all parameters for which primary or secondary drinking water standards have been established using methods with a lower limit of detection that is less than the standards. These four new wells should be logged to help define aquifer geometry, including the possible presence of faults, in the Project vicinity. The water quality monitoring program should be continued throughout the life of the project, although at a reduced monitoring frequency, at a reduced number of sites, and for a reduced parameter list.

I.B Recommended Water Monitoring Program

In sum, I recommend a minimum of a 1-year of preconstruction monitoring to develop the following basic information which is essential to evaluate the water-realted impacts of the Project:

- aquifer properties
- location and characteristics of nearby wells
- seasonal water levels in nearby wells
- baseline water quality upgradient and downgradient of the site/ponds

This information is essential to evaluate Project impacts and therefore should be collected and analyzed before the Project is certified to assure that adverse impacts are appropriately mitigated.

II. AIR QUALITY

With regard to the need for preconstruction air quality studies, I have reviewed numerous documents, including the subject petitions, AFC, TMPP's responses to staff and CURE data requests, and the preliminary staff assessment ("PSA").[10] I also directed and reviewed the results of two site inspections of the Brush Mountain meteorological station. The results of these inspections are included in a declaration from Marcy and Jim Crockett in Exhibit 2 to my declaration.

[10] California Energy Commission, Preliminary Staff Assessment, Air Quality, December 10, 1999.

Based on my review of this information, I agree with petitioners that the meteorological data set used by applicants is not adequate to evaluate the Project's air quality impacts. A minimum of 1 year of representative preconstruction meteorological data is required to analyze the Project's air quality impacts. In the following sections, I discuss the basis for my opinion and propose a minimally acceptable preconstruction monitoring program.

II.A Meteorological Data

The applicant claimed that 1995 meteorological data[11] from Soldier Mountain, located 12 miles northeast of Burney, was used to model air quality impacts of the Project. (AFC, pp. 6.8-5, 6.8-44; Response to CURE Data Request 17a.) However, the Soldier Mountain meteorological station was relocated to Brush Mountain over 10 years ago.[12] The data used to model Project impacts was actually collected on Brush Mountain. This station, which is located on the opposite side of the mountain from the Project site, is not representative of conditions at the project site. Further, the station is located unacceptably close to obstructions which affect the wind and temperature fields and only collects data for the last ten minutes of each hour or 17 percent of the time. Therefore, this data is not suitable for dispersion modeling, as discussed below.

II.A.1 Regulatory Standards for Meteorological Data

The NSR Manual[13] provides guidance on meteorological monitoring for PSD purposes. (NSR Manual, §III.C.)[14] This guidance requires that

---

[11] As discussed below in section II.A.6, the applicant has revised the 1995 data and expanded the data set to include 1997 and 1998. (TMPP Response to CURE Data Request 17d.)

[12] Personal communications, Tim McCammon, Batallion Chief, Burney Station, California Department of Forestry, November 9, 1999.

[13] U.S. EPA, New Source Review Workshop Manual. Prevention of Significant Deterioration and Nonattainment Area Permitting, Draft, October 1990.

[14] The NSR Manual has been accepted by EPA's Environmental Appeals Board as the most current statement of the Agency's thinking on PSD issues and is routinely used to decide cases involving matters of federal law. See, e.g., *In re Masonite Corporation*, 5

meteorological data be representative of the atmospheric dispersion and climatological conditions at the site of the proposed source and lists several guidance documents that should be used to establish the location and validity of the resulting data. The proposed meteorological station ("met" station) is wholly inconsistent with the standards in every one of these guidance documents.

II.A.2 Location of Meteorological Monitoring Site in Relation to Project Site

Based on two site visits under my direction,[15] the Brush Mountain meteorological station is located about 5 miles northeast of the Project site on Brush Mountain on a southeast facing slope at an elevation of 3,760 feet,[16] not on Soldier Mountain as claimed by the applicant. The plant site, on the other hand, is located in Burney Valley at an elevation of 3,140 feet (AFC, Fig. 2.1-3), 620 feet lower than the met station and on the opposite side of Brush Mountain. The Burney Valley is a narrow valley, about 4 miles long and about 1 mile wide, surrounded by elevated terrain on all sides.[17]

II.A.3 Physical Setting

The met station is on the side of the mountain while the plant site is in a valley surrounded by mountains on all sides. These distinct topographic settings generally result in distinct meteorological conditions, as has been widely recognized in the literature.[18] Employees

---

E.A.D. 558 (EAB 1994); *In re Inter-Power of New York, Inc.*; 5 E.A.D. 135 (EAB 1994); *In re Hawaiian Commercial & Sugar Company*, 4 E.A.D. 99 (EAB 1992).

[15] Declaration of Jim and Marcy Crockett, December 15, 1999.

[16] http://cdec.water.ca.gov/cgi-progs/queryF?s=sld.

[17] USGS, Burney Quadrangle, 7.5 Minute Topographic Map, Provisional Edition, 1990; DeLorme Publishing Co., Northern California Atlas & Gazetteer, 1986, p. 48.

[18] S.K. Kao, H.N. Lee and K.I. Smidy, A Preliminary Analysis of the Effect of Mountain-Valley Terrains on Turbulence and Diffusion, Symposium on Atmospheric Diffusion and Air Pollution, American Meteorological Society, Santa Barbara, CA, 1974, pp. 59-63; J.C.R. Hunt, W.H. Snyder, and R.E. Lawson, Jr., Flow Structure and Turbulent Diffusion Around a Three Dimensional Hill, Part 1, U.S. EPA Report EPA-600/4-78-041, 1978; W.D. Neff and C.W. King, Observations of Complex-Terrain Flows Using Acoustic

of the California Department of Forestry who are personally familiar with the Brush Mountain site state that Brush Mountain met data is not representative of the Burney Valley.[19]

Valley sites, for example, are influenced by wind channeling along the axis of the valley, lingering stagnant conditions in the valley bottom, inversions, and/or density-driven upslope or downslope drainage flows that do not occur on mountain sides.

Mountain sides, on the other hand, are influenced by channeling of flow around mountains and wind speedup over the crest of elevated terrain. Under light winds, flow over ridges forms a smooth, shallow wave and close to the surface, vertical currents exist. With stronger winds, large semipermanent eddies form to the lee of the mountain, creating a larger effective shape of the mountain with respect to flows aloft. With stable stratification and even strong winds increasing with height, a lee wave system develops downwind of the mountain ridge. Under very strong winds, severe turbulence and quasi-stationary rotary vortices occur in the lee of the mountain ridge. Finally, wind speeds are generally much higher on the side of a mountain, increasing logarithmically with height.

Therefore, dispersion is generally poorer in valleys than on mountain sides. Stagnant conditions and inversions are common in valleys and rare on the sides of a mountain, resulting in localized concentration of air pollutants in the valley. Inversions are acknowledged to occur in the Burney Valley in the winter (PSA, pp. 7, 17), and residents claim they are common. For example, on December 12, 1999 between 1400 and 1500, wind speeds at the met station gusted

---

Sounders: Experiments, Topography, and Winds, Boundary-Layer Meteorology, v. 40, 1987, pp. 363-392; M.W. Gallagher, T.W. Choularton, and M.K. Hill, Some Observations of Airflow Over a Large Hill of Moderate Slope, Boundary-Layer Meteorology, v. 42, 1988, pp. 229-250.

up to 5 to 10 mph and averaged 2 to 5 mph during the last 10 minutes of each hour. However, at the base of Brush Mountain in the Burney Valley, the air was stagnant and an inversion engulfed the entire Valley. (Crockett 12/15/99.) Therefore, the Brush Mountain meteorological data set could substantially underestimate air quality impacts of the project.

EPA guidance clearly directs that "[i]f the area is a valley or a sea coast, then the meteorological instruments should be in that valley or near the coast; *not on a nearby hilltop* or inland 30 km at a more convenient airport site." This forbidden condition describes exactly the situation we have here: a plant site in a valley and a meteorological station on the opposide side of the mountain from Burney, 620 feet above the elevation of the plant site. This situation is strictly forbidden by EPA guidance. (USEPA 3/95,[20] §4.0.4.3.3.)

II.A.4 Terrain Surrounding Meteorological Station

Because most atmospheric properties change dramatically with height and surroundings, met stations should always be located in open terrain at a reasonable distance from obstructions, such as buildings, trees, hills, and other similar features. (USEPA 3/95, §4.0.4.3.2.) The Brush Mountain station is located on a 20-foot high knoll next to cinder pits and a mountain.

The surrounding area was inspected, measurements taken using a laser range finder and GPS, and photographed under the direction of Dr. Fox on November 7 and December 12, 1999. This work indicates that the area to the east and south of the met station is open, and no obstructions are present. However, piles of cinder, some up to about 150 feet tall, are located 210 feet west of the station and 220 to 315 north of

---

[19] Personal communications with Paul Genera, Burney Station, California Department of Forestry, November 1999 and George Castle, Fire Captain, Redding Station, California Department of Forestry, November-December 1999.

[20] U.S. EPA, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV: Meteorological Measurements (As Revised March, 1995), Report EPA/600/R-94/038d, March 1995.

the station. The cinder piles extend up to about 100 feet above the elevation of the base of the met station. A mountain, which is being excavated to supply the cinder, is located 370 to 475 feet northwest of the station and towers about 200 feet above the elevation of the base of the met station. Trees, about the same height as the 10-meter high met station, are located 130 feet from the station. See photographs in Exhibit -- to Fox Declaration.

These conditions violate EPA's siting guidelines. These guidelines require that wind speed and direction instruments be located where the horizontal distance between the station and any obstruction is at least ten times the height of the obstruction. This requires that the met station be located at least 1, 000 feet from the cinder piles and at least 2,000 feet from the mountain. The met station, however, is unacceptably close to these obstructions because it is located 210 to 315 feet from the cinder piles and 370 to 475 feet from the mountain. Therefore, wind speed and direction measured at this site may be adversely affected by turbulence, eddies, and wakes created by these obstructions which are not present at the plant site.

Similarly, EPA's guidelines require that temperature and humidity sensors should be located such that the horizontal distance between the station and the obstruction is at least four times the height of the obstruction. This would require that the met station be located at least 400 feet from the cinder piles and at least 800 feet from the mountain. As noted above, the met station is unacceptably close to these obstructions because it is located 210 to 315 feet from the cinder piles and 370 to 475 feet from the mountain. These obstructions could result in inaccurate temperature and relative humidity measurements.

II.A.5 Data Capture Inadequacies of Met Site

The Brush Mountain site is operated by the California Department of Forestry to evaluate fire conditions in the Burney Basin. The data

capture and quality control requirements for fire monitoring are much less stringent than those for air quality modeling.

The Brush Mountain station is remotely located and only collects data during the last 10 minutes of each hour to reduce the facility's electricity bill.[21] For modeling, a minimum of one hour average data is required. (USEPA 5/87,[22] p. 48.) Further, EPA guidelines require a minimum of 80 percent data capture at remote sites. (Ibid., p. 55; USEPA 6/87,[23] p. 5-7.) Here, data is only captured for 10 minutes out of each hour, or 17 percent of the time. This is far below the minimum data capture allowed for remote sites and is wholly unacceptable for modeling. EPA explicitly recognizes that these conditions, which also occur at airport sites, do not result in met data that are representative of site conditions. (EPA 3/95, §4.0.3.3.)

II.A.6 Instrumentation Limitations

As noted above, the requirements for fire monitoring are far less stringent than the requirements for air quality modeling. This is because fire control personnel are generally only interested in identifying high fire risk conditions (e.g., high winds, low precipitation, high temperatures). A review and analysis of the Brush Mountain data set suggest either serious quality control problems or the intentional selection of instruments that are accurate only in the ranges of interest for fire monitoring (e.g., high wind speeds, high temperatures)

Calms, or wind speeds less than the threshold velocity (i.e., lower limit of detection) of the anemometer, typically occur much less than 1 percent of the time at met stations operated to collected data for air quality modeling. Modern anemometers used to collect data suitable for

---

[21] Personal communication, George Castle, Fire Captain, Redding Office, California Department of Forestry (530-225-2411), November 9, 1999.

[22] U.S. EPA, Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD), Report EPA-450/4-87-007, May 1987.

[23] U.S. EPA, On-Site Meteorological Program Guidance for Regulatory Modeling Applications, Report EPA-450/4-87-013, June 1987.

air dispersion modeling are able to accurately measure wind speed of 0.5 m/s or lower. (USEPA 6/97, p. 8-3.) Wind speeds less than 0.5 m/s would be extremely rare on the side of a mountain at 3,760 feet above sea level.

However, the dataset that the applicant used for dispersion modeling had an unusually high percent of calms, 19 percent. In response to CURE data request 17d on this issue, the applicant had Trinty Consultants, Inc. review the data. Trinity concluded that the anemometer may have been stuck during the month of May 1995. Trinity corrected the obvious errors and exanded the data set to include 1997 and 1998 (1996 was missing from the website). (TMPP Response to CURE Data Request 17d.)

The revised data set that the applicant proposes to use for modeling suggests that calms occurred 13.3 percent of the time in 1995, 10 percent of the time in 1997, and 15.9 percent of the time in 1998. (*Id*.) This is highly unlikely and suggests that the anemometer may not be sensitive enough to measure lower wind speeds (which would not be a problem for fire monitoring) or that there was an unusually high frequency of operational problems, as suspected by Trinity for May 1995.

Conversations with operators of the met station indicate that the station does not use heaters during the winter, as is common in cold climates. Many of the instruments used to record meteorological parameters are adversely affected by snow and are sensitive to low temperatures, which reach -26 F in the area. (AFC, p. 6.8-5.) Therefore, winter measurements from the met station may be inaccurate and should not be used for modeling the Project's impacts, further reducing data capture below 17 percent.

II.B Recommended Meteorological Monitoring Program

As discussed above, the met data set relied on by the applicant is not suitable for dispersion modeling. Further, there are no other meteorolgical stations in the vicinity of the Project. Therefore, I

recommend that a minimum of 1 year of on-site meteorological data be collected, including the following:

- hourly average wind speed and direction
- hourly average sigma-theta
- hourly surface temperature
- hourly precipitation amounts

All of this data should be collected at the plant site using a standard 10-meter tower.

J. PHYLLIS FOX, PH.D

Dr. Fox has over 28 years of experience in the field of environmental engineering, including water quality and water supply investigations, environmental permitting, air quality management, nuisance investigations, environmental impact reports, CEQA/NEPA documentation, risk assessments, and litigation support. Her technical education in environmental engineering and her broad-based knowledge in environmental regulations has been instrumental in her successful management of a wide variety of environmental projects. Dr. Fox founded Fox Environmental Management in 1981.

EDUCATION

Ph.D. Environmental Engineering, University of California, Berkeley, 1980.
M.S. Environmental Engineering, University of California, Berkeley, 1975.
B.S. Physics (with high honors), University of Florida, Gainesville, 1971.

REGISTRATION

Environmental Assessor in California (#REA-00704).

PROFESSIONAL HISTORY

Environmental Management, Principal, 1981-present
Lawrence Berkeley Laboratory, Principal Investigator, 1977-1981
University of California, Berkeley, Research Assistant and Project Manager, 1976-1977
Bechtel, Inc., Engineer, 1971-1976

PROFESSIONAL AFFILIATIONS

Society of Environmental Toxicology and Chemistry
Association for the Environmental Health of Soils
American Chemical Society
Phi Beta Kappa
Sigma Pi Sigma

Who's Who Environmental Registry, PH Publishing, Fort Collins, CO, 1992.
Who's Who in the World, Marquis Who's Who, Inc., Chicago, IL, 11th Ed., p. 371, 1993-present.
Who's Who of American Women, Marquis Who's Who, Inc., Chicago, IL, 13th Ed., p. 264, 1984-present.
Who's Who in Science and Engineering, Marquis Who's Who, Inc., New Providence, NJ, 5th Ed., p. 414, 1999-present.

Guide to Specialists on Toxic Substances, World Environment Center, New York, NY, p. 80, 1980.
National Research Council Committee on Irrigation-Induced Water Quality Problems (Selenium), Subcommittee on Quality Control/Quality Assurance (1985-1990).
National Research Council Committee on Surface Mining and Reclamation, Subcommittee on Oil Shale (1978-80)

REPRESENTATIVE EXPERIENCE

Site Investigation/Remediation/Closure

- Technical manager and principal engineer for characterization, remediation, and closure of waste management units at former oil shale plant in Colorado. Completed groundwater monitoring programs, site assessments, work plans, and closure plans for seven process water holding ponds, a refinery sewer system, and processed shale disposal area. Managed design and construction of groundwater treatment system and removal actions and obtained clean closure.

- Principal engineer for characterization, remediation, and closure of process water ponds at a former lanthanide processing plant in Colorado. Designed and implemented groundwater monitoring program and site assessments and prepared closure plan.

- Advised the City of Sacramento on redevelopment of two former railyards. Reviewed work plans, site investigations, risk assessment, RAPs, RI/FSs, and CEQA documents. Participated in the development of mitigation strategies to protect construction and utility workers and the public during remediation, redevelopment, and use of the site, including buffer zones, subslab venting, rail berm containment structure, and an environmental oversight plan.

- Provided technical support for the investigation of a former sanitary landfill that was redeveloped as single family homes. Reviewed and/or prepared portions of numerous documents, including health risk assessments, preliminary endangerment assessments, site investigation reports, work plans, and RI/FSs.

- Technical oversight of characterization and remediation of a nitrate plume at an explosives manufacturing facility in Lincoln, CA. Provided interface between owners and consultants. Reviewed site assessments, work plans, closure plans, and RI/FSs.

Expert Witness/Litigation Support

- Represented business owner facing eminent domain eviction. Prepared technical comments on soil contamination on a negative declaration for a proposed redevelopment project in San Francisco in support of a CEQA lawsuit. Case settled.

- Represented residents living downwind of an asphalt plant in separate nuisance and CEQA lawsuits. Prepared technical comments on CEQA documents, presented testimony at Commission and Council meetings, and participated in settlement discussions.

- Represented a major builder in claims alleging health effects from faulty installation of gas appliances. Conducted indoor air quality study, advised counsel on merits of case, and participated in discussions with plaintiffs. Case settled.

- Represented property owners in suit to recover remediation costs from insurer for large TCE plume. Conducted investigations to demonstrate sudden and accidental release of TCE, including groundwater modeling, development of method to date spill, preparation of chemical inventory, and onsite sewer and storm drainage inspections and sampling. Prepared declaration in opposition to motion for summary judgement. Case settled.

- Represented residents downwind of a former battery plant in class action lawsuit alleging property contamination from lead emissions. Conducted historical research and dry deposition modelling that substantiated claim. Participated in mediation at JAMS. Case settled.

- Represented property owners who purchased a former gas station that had leaking underground storage tanks. Reviewed agency files and advised counsel on merits of case. Prepared declaration in opposition to summary judgement. Prepared cost estimate to remediate site. Participated in settlement discussions. Case settled.

- Consultant to counsel representing plaintiffs in two Clean Water Act lawsuits involving selenium discharges from refineries. Reviewed files and advised counsel on merits of case. Prepared interrogatory and discovery questions, assisted in deposing opposing experts, and reviewed and interpreted treatability and other technical studies. Judge ruled in favor of plaintiffs.

- Represented residents downwind of gravel mine and asphalt plant in suit to obtain CEQA review of permitting action. Prepared two declarations analyzing air quality and public health impacts. Judge ruled in favor of plaintiffs, closing mine and asphalt plant.

- Represented defendant oil company in class action lawsuit alleging property damage and health effects from subsurface petroleum contamination. Reviewed documents, prepared risk

calculations, and advised counsel on merits of case. Participated in settlement discussions. Case settled.

- Represented defendant oil company in class action lawsuit alleging health impacts from remediation of petroleum contaminated site. Reviewed documents, designed and conducted monitoring program, and participated in settlement discussions. Case settled.

- Consultant to attorneys evaluating a challenge of USFWS actions under CVPIA Section 3406(b)(2). Reviewed agency files and collected and analyzed hydrology, water quality, and fishery data. Advised counsel on merits of case.

- Represented residents downwind of Carson refinery in class action lawsuit involving soil and groundwater contamination, nuisance, property damage, and health effects. Reviewed files and provided advise on contaminated soil and groundwater, toxic emissions, and health risks. Prepared declaration on refinery fugitive emissions. Prepared deposition questions and reviewed deposition transcripts on air quality, soil contamination, odors, and health impacts. Case settled.

- Represented residents downwind of Contra Costa refinery who were affected by an accidental release of naphtha. Characterized spilled naphtha, estimated emissions, and modelled ambient concentrations of hydrocarbons and sulfur compounds. Deposed. Presented testimony in binding arbitration at JAMS. Judge found in favor of plaintiffs.

- Represented residents downwind of Contra Costa County refinery in class action lawsuit alleging property damage, nuisance, and health effects from several large accidents as well as routine operations. Reviewed files and prepared analyses of environmental impacts. Prepared declarations, deposed, and presented testimony before jury in one trial and judge in second. Case pending.

- Represented business owner claiming damages from dust, noise, and vibration during a sewer construction project. Review agency files and PM10 monitoring data and advised counsel on merits of case. Case settled.

- Represented residents downwind of Contra Costa County refinery in class action lawsuit alleging property damage, nuisance, and health effects. Prepared declaration in opposition to summary judgement, deposed, and presented expert testimony on accidental releases, odor, and nuisance before jury. Case thrown out by judge, but reversed on appeal and to be retried.

- Presented testimony in small claims court on behalf of residents claiming health effects from flaring emissions triggered by a power outage at a Contra Costa County refinery. Analyzed

meteorological and air quality data and evaluated potential health risks of exposure to low concentrations of hydrogen sulfide.

- Represented construction unions in Prevention of Significant Deterioration permitting action for an Indiana steel mill. Prepared technical comments and drafted 70-page appeal of agency permit action to the Environmental Appeals Board, challenging permit. EPA Region V and the EPA General Counsel intervened, supporting petitioners. Drafted brief responding to four parties. Case pending before the EAB.

- Represented defendant urea manufacturer in negotiations with USEPA to seek relief from penalties for alleged violations of the Clean Air Act. Evaluated regulatory files and monitoring data, prepared technical analysis demonstrating that permit limits were not violated, and participated in negotiations with EPA to dismiss action. Fines were substantially reduced and case closed.

- As part of a consent decree settling a CEQA lawsuit, represented neighbors of a large west coast port in negotiations with port authority to secure mitigation for air quality impacts. Prepared technical comments on mobile source air quality impacts and mitigation and negotiated a $9 million CEQA mitigation package.

- Represented defendant foundary in lawsuit alleging property contamination, nuisance, trespass, smoke, and health effects from foundary operation. Inspected and sampled plaintiff's property. Advising counsel on merits of case. Case in progress.

- For over 100 industrial facilities and redevelopment projects, developed the record in preparation for CEQA challenges by preparing technical comments on hazardous materials, solid wastes, public utilities, worker safety, air quality, public health, water resources, water quality, and risk of upset sections of EIRs and negative declarations. Assisted counsel in drafting briefs.

Environmental Management/Investigations

- Nuisance investigations (odor, noise, dust, smoke, indoor air quality, contamination). Property damage from environmental contamination. Accident investigation and reconstruction. Risk of upset analyses. Environmental forensics.

- Preparation and review of geohydrologic, water quality, and water supply investigations. Engineering and modelling studies on surface and ground water contamination, air pollution, thermal pollution, eutrophication, industrial waste treatment, and solid waste disposal for a variety of domestic and international projects.

- Literature surveys and historical research . Risk assessments, preliminary endangerment assessments, and other health studies. Statistical analyses and computer simulations. Design and evaluation of environmental monitoring programs.

- Hazardous waste investigations including Phase I/II assessments, remedial investigations, feasibility studies, remedial action plans, work plans, closure plans, and other environmental investigations and documentation.

- Developed, directed, and participated in a broad-based research program on environmental issues and control technology for energy industries including petroleum, oil shale, coal mining, and coal slurry transport. Research included evaluation of air and water pollution, development of novel, low-cost technology to treat and dispose of wastes, and development and application of geohydrologic models to evaluate subsurface contamination from in-situ retorting. The program consisted of government and industry contracts and employed 45 technical and administrative personnel.

- Coordinated a high-level task force established to investigate corrosion/erosion-type failures of nuclear power plants. Developed and applied numerical models of water treatment processes, groundwater systems, estuaries, and river systems. Developed several large-scale data management systems for environmental monitoring data.

- Designed, implemented, and directed a community monitoring program to assure that residents downwind of a petroleum-contaminated site were not impacted by remediation. The program include real-time monitoring of particulates, diesel exhaust, and BTEX and time integrated monitoring for over 100 chemicals.

- Historical research for a Preliminary Endangerment Assessment on a former landfill that was developed as single family homes. Acquired, reviewed, and analyzed the files of 18 federal, state and local agencies, three sets of construction field notes, analyzed 21 aerial photographs and interviewed 14 individuals associated with operation of former landfill. Prepared summary report.

Regulatory Permitting/Negotiations

- Prepared Authority to Construct Permit for remediation of a large petroleum-contaminated site on the Central Coast. Negotiated conditions with agencies and secured permits.

- Prepared Authority to Construct Permit for remediation of a former oil field on the Central Coast. Participated in negotiations with agencies and secured permits.

- Prepared and/or reviewed hundreds of environmental permits, including NPDES, UIC, Stormwater, Authority to Construct, Prevention of Significant Deterioration, and RCRA, among others.

- Participated in the development of the CARB document, *Guidance for Power Plant Siting and Best Available Control Technology*, including attending public workshops and filing technical comments.

- Performed data analyses in support of adoption of emergency power restoration standards by the Public Utilities Commission for "major" power outages, where major is an outage that simultaneously affects 10% of the customer base.

- Drafted portions of the Good Neighbor Ordinance to grant Contra Costa County greater authority over safety of local industry, particularly chemical plants and refineries.

- Participated in drafting BAAQMD Regulation 8, Rule 28, Pressure Relief Devices, including participation in public workshops, review of staff reports, draft rules and other technical materials, preparation of technical comments on staff proposals, research on availability and costs of methods to control PRV releases, and negotiations with staff.

- Participated in amending BAAQMD Regulation 8, Rule 18, Valves and Connectors, including participation in public workshops, review of staff reports, proposed rules and other supporting technical material, preparation of technical comments on staff proposals, research on availability and cost of low-leak technology, and negotiations with staff.

- Participated in amending BAAQMD Regulation 8, Rule 25, Pumps and Compressors, including participation in public workshops, review of staff reports, proposed rules, and other supporting technical material, preparation of technical comments on staff proposals, research on availability and costs of low-leak and seal-less technology, and negotiations with staff.

- Participated in amending BAAQMD Regulation 8, Rule 5, Storage of Organic Liquids, including participation in public workshops, review of staff reports, proposed rules, and other supporting technical material, preparation of technical comments on staff proposals, research on availability and costs of controlling tank emissions, and presentation of testimony before the Board.

- Participated in amending BAAQMD Regulation 8, Rule 18, Valves and Connectors at Petroleum Refinery Complexes, including participation in public workshops, review of staff reports, proposed rules and other supporting technical material, preparation of technical comments on staff proposals, research on availability and costs of low-leak technology, and presentation of testimony before the Board.

- Participated in amending BAAQMD Regulation 8, Rule 22, Valves and Flanges at Chemical Plants, etc, including participation in public workshops, review of staff reports, proposed rules, and other supporting technical material, preparation of technical comments on staff proposals, research on availability and costs of low-leak technology, and presentation of testimony before the Board.

- Participated in amending BAAQMD Regulation 8, Rule 25, Pump and Compressor Seals, including participation in public workshops, review of staff reports, proposed rules, and other supporting technical material, preparation of technical comments on staff proposals, research on availability of low-leak technology, and presentation of testimony before the Board.

- Participated in the development of the BAAQMD Regulation 2, Rule 5, Toxics, including participation in public workshops, review of staff proposals, and preparation of technical comments.

- Participated in the development of SCAQMD Rule 1402, Control of Toxic Air Contaminants from Existing Sources, and proposed amendments to Rule 1401, New Source Review of Toxic Air Contaminants, in 1993, including review of staff proposals and preparation of technical comments on same.

- Participated in the development of the Sunnyvale Ordinance to Regulate the Storage, Use and Handling of Toxic Gas, which was designed to provide engineering controls for gases that are not otherwise regulated by the Uniform Fire Code.

- Participated in the drafting of the Statewide Water Quality Control Plans for Inland Surface Waters and Enclosed Bays and Estuaries, including participation in workshops, review of draft plans, preparation of technical comments on draft plans, and presentation of testimony before the SWRCB.

- Participated in developing Se permit effluent limitations for the five Bay Area refineries, including review of staff proposals, statistical analyses of Se effluent data, review of literature on aquatic toxicity of Se, preparation of technical comments on several staff proposals, and presentation of testimony before the Bay Area RWQCB.

- Represented the California Department of Water Resources in the 1991 Bay-Delta Hearings before the State Water Resources Control Board, presenting sworn expert testimony with cross examination and rebuttal on a striped bass model developed by the California Department of Fish and Game.

- Represented the State Water Contractors in the 1987 Bay-Delta Hearings before the State Water Resources Control Board, presenting sworn expert testimony with cross examination

and rebuttal on natural flows, historical salinity trends in San Francisco Bay, Delta outflow, and hydrodynamics of the South Bay.

- Participated in the development of the Basin Plans for the Sacramento, San Joaquin, and Delta basins, including all of the technical analyses and writing for sections on water quality, water supply, agricultural drainage, and waste load allocations.

- Represented intervenors in the licensing of ten natural-gas-fired power plants at the California Energy Commission. Reviewed and prepared technical comments on AFCs, PSAs, FSAs, PDOCs, FDOCs, and PSDs in areas of air quality, water supply, water quality, biology, public health, worker safety, transportation, site contamination, and hazardous materials. Presented written and oral testimony in evidentiary hearings with cross examination and rebuttal. Participated in technical workshops.

- Represented several parties in the proposed merger of San Diego Gas & Electric and Southern California Edison. Prepared independent technical analyses on health risks, air quality, and water quality. Presented written and oral testimony before the Public Utilities Commission with cross examination and rebuttal.

- Represented a PRP in negotiations with local health and other agencies to establish impact of subsurface contamination on overlying residential properties. Reviewed health studies prepared by agency consultants and worked with agencies and their consultants to evaluate health risks.

Water Quality/Resource Planning

- Directed and participated in research on environmental impacts of energy development in the Colorado River Basin, including contamination of surface and subsurface waters and modeling of fractured aquifers.

- Played a major role in Northern California water resource planning studies since the early 1970s. Prepared portions of the Basin Plans for the Sacramento, San Joaquin, and Delta basins including sections on water supply, water quality, and agricultural drainage.

- Conducted hundreds of studies over the past 30 years on Delta water supplies and their impacts on water and biological resources of the Central Valley, Sacramento-San Joaquin Delta, and San Francisco Bay.

PUBLICATIONS AND PRESENTATIONS (Partial List)

San Luis Obispo County Air Pollution Control District and San Luis Obispo County Public Health Department, *Community Monitoring Program*, February 8, 1999.

The Bay Institute, *From the Sierra to the Sea. The Ecological History of the San Francisco Bay-Delta Watershed*, 1998.

J. Phyllis Fox, *Well Interference Effects of HDPP's Proposed Wellfield in the Victor Valley Water District*, Prepared for the California Unions for Reliable Energy (CURE), October 12, 1998.

J. Phyllis Fox, *Air Quality Impacts of Using CPVC Pipe in Indoor Residential Potable Water Systems*, Report Prepared for California Pipe Trades Council, California Firefighters Association, and other associations, August 29, 1998.

J. Phyllis Fox and others, *Authority to Construct Avila Beach Remediation Project*, Prepared for Unocal Corporation and submitted to San Luis Obispo Air Pollution Control District, June 1998.

J. Phyllis Fox and others, *Authority to Construct Former Guadalupe Oil Field Remediation Project*, Prepared for Unocal Corporation and submitted to San Luis Obispo Air Pollution Control District, May 1998.

J. Phyllis Fox and Robert Sears, *Health Risk Assessment for the Metropolitan Oakland International Airport Proposed Airport Development Program*, Prepared for Plumbers & Steamfitters U.A. Local 342, December 15, 1997.

Levine-Fricke-Recon (Phyllis Fox and others), *Preliminary Endangerment Assessment Work Plan for the Study Area Operable Unit, Former Solano County Sanitary Landfill, Benicia, California*, Prepared for Granite Management Co. for submittal to DTSC, September 26, 1997.

Phyllis Fox and Jeff Miller, "Fathead Minnow Mortality in the Sacramento River," *IEP Newsletter*, v. 9, n. 3, 1996.

Jud Monroe, Phyllis Fox, Karen Levy, Robert Nuzum, Randy Bailey, Rod Fujita, and Charles Hanson, *Habitat Restoration in Aquatic Ecosystems. A Review of the Scientific Literature Related to the Principles of Habitat Restoration*, Part Two, Metropolitan Water District of Southern California (MWD) Report, 1996.

Phyllis Fox and Elaine Archibald, *Aquatic Toxicity and Pesticides in Surface Waters of the Central Valley*, California Urban Water Agencies (CUWA) Report, September 1997.

Phyllis Fox and Alison Britton, *Evaluation of the Relationship Between Biological Indicators and the Position of X2*, CUWA Report, 1994.

Phyllis Fox and Alison Britton, *Predictive Ability of the Striped Bass Model*, WRINT DWR-206, 1992.

J. Phyllis Fox, *An Historical Overview of Environmental Conditions at the North Canyon Area of the Former Solano County Sanitary Landfill*, Report Prepared for Solano County Department of Environmental Management, 1991.

J. Phyllis Fox, *An Historical Overview of Environmental Conditions at the East Canyon Area of the Former Solano County Sanitary Landfill*, Report Prepared for Solano County Department of Environmental Management, 1991.

Phyllis Fox, *Trip 2 Report, Environmental Monitoring Plan, Parachute Creek Shale Oil Program*, Unocal Report, 1991.

J. P. Fox and others, "Long-Term Annual and Seasonal Trends in Surface Salinity of San Francisco Bay," *Journal of Hydrology*, v. 122, p. 93-117, 1991.

J. P. Fox and others, "Reply to Discussion by D.R. Helsel and E.D. Andrews on Trends in Freshwater Inflow to San Francisco Bay from the Sacramento-San Joaquin Delta," *Water Resources Bulletin*, v. 27, no. 2, 1991.

J. P. Fox and others, "Reply to Discussion by Philip B. Williams on Trends in Freshwater Inflow to San Francisco Bay from the Sacramento-San Joaquin Delta," *Water Resources Bulletin*, v. 27, no. 2, 1991.

J. P. Fox and others, "Trends in Freshwater Inflow to San Francisco Bay from the Sacramento-San Joaquin Delta," *Water Resources Bulletin*, v. 26, no. 1, 1990.

J. P. Fox, "Water Development Increases Freshwater Flow to San Francisco Bay," *SCWC Update*, v. 4, no. 2, 1988.

J. P. Fox, *Freshwater Inflow to San Francisco Bay Under Natural Conditions*, State Water Contracts, Exhibit 262, 58 pp., 1987.

J. P. Fox, "The Distribution of Mercury During Simulated In-Situ Oil Shale Retorting," *Environmental Science and Technology*, v. 19, no. 4, pp. 316-322, 1985.

J. P. Fox, "El Mercurio en el Medio Ambiente: Aspectos Referentes al Peru," Proceedings of Simposio Los Pesticidas y el Medio Ambiente," ONERN-CONCYTEC, Lima, Peru, April 25-27, 1984. (Also presented at Instituto Tecnologico Pesquero and Instituto del Mar del Peru.)

J. P. Fox, "Mercury, Fish, and the Peruvian Diet," *Boletin de Investigacion*, Instituto Tecnologico Pesquero, Lima, Peru, v. 2, no. 1, pp. 97-116, l984.

J. P. Fox, P. Persoff, A. Newton, and R. N. Heistand, "The Mobility of Organic Compounds in a Codisposal System," *Proceedings of the Seventeenth Oil Shale Symposium*, Colorado School of Mines Press, Golden, CO, 1984.

P. Persoff and J. P. Fox, "Evaluation of Control Technology for Modified In-Situ Oil Shale Retorts," *Proceedings of the Sixteenth Oil Shale Symposium*, Colorado School of Mines Press, Golden, CO, 1983.

J. P. Fox, *Leaching of Oil Shale Solid Wastes: A Critical Review*, University of Colorado Report, 245 pp., July 1983.

J. P. Fox, *Source Monitoring for Unregulated Pollutants from the White River Oil Shale Project*, VTN Consolidated Report, June 1983.

A. S. Newton, J. P. Fox, H. Villarreal, R. Raval, and W. Walker II, *Organic Compounds in Coal Slurry Pipeline Waters*, Lawrence Berkeley Laboratory Report LBL-15121, 46 pp., Sept. 1982.

M. Goldstein et al., *High Level Nuclear Waste Standards Analysis, Regulatory Framework Comparison*, Battelle Memorial Institute Report No. BPMD/82/E515-06600/3, Sept. 1982.

J. P. Fox et al., *Literature and Data Search of Water Resource Information of the Colorado, Utah, and Wyoming Oil Shale Basins*, Vols. 1-12, Bureau of Land Management, 1982.

A. T. Hodgson, M. J. Pollard, G. J. Harris, D. C. Girvin, J. P. Fox, and N. J. Brown, *Mercury Mass Distribution During Laboratory and Simulated In-Situ Retorting*, Lawrence Berkeley Laboratory Report LBL-12908, 39 pp., Feb. 1982.

E. J. Peterson, A. V. Henicksman, J. P. Fox, J. A. O'Rourke, and P. Wagner, *Assessment and Control of Water Contamination Associated with Shale Oil Extraction and Processing*, Los Alamos National Laboratory Report LA-9084-PR, 54 pp., April 1982.

P. Persoff and J. P. Fox, *Control Technology for In-Situ Oil Shale Retorts*, Lawrence Berkeley Laboratory Report LBL-14468, 118 pp., Dec. 1982.

J. P. Fox, *Codisposal Evaluation: Environmental Significance of Organic Compounds,* Development Engineering Report, 104 pp., April 1982.

J. P. Fox, *A Proposed Strategy for Developing an Environmental Water Monitoring Plan for the Paraho-Ute Project*, VTN Consolidated Report, Sept. 1982.

J. P. Fox, D. C. Girvin, and A. T. Hodgson, "Trace Elements in Oil Shale Materials," *Energy and Environmental Chemistry, Fossil Fuels*, v.1, pp. 69-101, 1982.

M. Mehran, T. N. Narasimhan, and J. P. Fox, "Hydrogeologic Consequences of Modified In-situ Retorting Process, Piceance Creek Basin, Colorado," *Proceedings of the Fourteenth Oil Shale Symposium*, Colorado School of Mines Press, Golden, CO, 1981 (LBL-12063).

U. S. DOE (J. P. Fox and others), *Western Oil Shale Development: A Technology Assessment*, v. 1-9, Pacific Northwest Laboratory Report PNL-3830, 1981.

J. P. Fox (ed), "Oil Shale Research," Chapter from the *Energy and Environment Division Annual Report 1980*, Lawrence Berkeley Laboratory Report LBL-11989, 82 pp., 1981 (author or co-author of four articles in report).

J. P. Fox, *The Partitioning of Major, Minor, and Trace Elements during In-Situ Oil Shale Retorting*, Ph.D. Dissertation, U. of Ca., Berkeley, also Report LBL-9062, 441 pp., 1980 (*Diss. Abst. Internat.*, v. 41, no. 7, 1981).

J.P. Fox, "Elemental Composition of Simulated *In Situ* Oil Shale Retort Water," *Analysis of Waters Associated with Alternative Fuel Production, ASTM STP 720*, L.P. Jackson and C.C. Wright, Eds., American Society for Testing and Materials, pp. 101-128, 1981.

J. P. Fox, P. Persoff, P. Wagner, and E. J. Peterson, "Retort Abandonment -- Issues and Research Needs," in *Oil Shale: the Environmental Challenges*, K. K. Petersen (ed.), p. 133, 1980 (Lawrence Berkeley Laboratory Report LBL-11197).

J. P. Fox and T. E. Phillips, "Wastewater Treatment in the Oil Shale Industry," in *Oil Shale: the Environmental Challenges*, K. K. Petersen (ed.), p. 253, 1980 (Lawrence Berkeley Laboratory Report LBL-11214).

R. D. Giauque, J. P. Fox, J. W. Smith, and W. A. Robb, "Geochemical Studies of Two Cores from the Green River Oil Shale Formation," *Transactions*, American Geophysical Union, v. 61, no. 17, 1980.

J. P. Fox, "The Elemental Composition of Shale Oils," Abstracts of Papers, 179th National Meeting, ISBN 0-8412-0542-6, Abstract No. FUEL 17, 1980.

J. P. Fox and P. Persoff, "Spent Shale Grouting of Abandoned In-Situ Oil Shale Retorts," *Proceedings of Second U.S. DOE Environmental Control Symposium*, CONF-800334/1, 1980 (Lawrence Berkeley Laboratory Report LBL-10744).

P. K. Mehta, P. Persoff, and J. P. Fox, "Hydraulic Cement Preparation from Lurgi Spent Shale," *Proceedings of the Thirteenth Oil Shale Symposium*, Colorado School of Mines Press, Golden, CO, 1980 (Lawrence Berkeley Laboratory Report LBL-11071).

F. E. Brinckman, K. L. Jewett, R. H. Fish, and J. P. Fox, "Speciation of Inorganic and Organoarsenic Compounds in Oil Shale Process Waters by HPLC Coupled with Graphite Furnace Atomic Absorption (GFAA) Detectors," Abstracts of Papers, Div. of Geochemistry, Paper No. 20, Second Chemical Congress of the North American Continent, August 25-28, 1980, Las Vegas (1980).

J. P. Fox, D. E. Jackson, and R. H. Sakaji, "Potential Uses of Spent Shale in the Treatment of Oil Shale Retort Waters," *Proceedings of the Thirteenth Oil Shale Symposium*, Colorado School of Mines Press, Golden, CO, 1980 (Lawrence Berkeley Laboratory Report LBL-11072).

J. P. Fox, *The Elemental Composition of Shale Oils*, Lawrence Berkeley Laboratory Report LBL-10745, 1980.

R. H. Fish, J. P. Fox, F. E. Brinckman, and K. L. Jewett, *Fingerprinting Inorganic and Organoarsenic Compounds in Oil Shale Process Waters Using a Liquid Chromatograph Coupled with an Atomic Absorption Detector*, Lawrence Berkeley Laboratory Report LBL-11476, 1980.

National Academy of Sciences (J. P. Fox and others), *Surface Mining of Non-Coal Minerals, Appendix II: Mining and Processing of Oil Shale and Tar Sands*, 222 pp., 1980.

J. P. Fox,"Elemental Composition of Simulated In-Situ Oil Shale Retort Water," in *Analysis of Waters Associated with Alternative Fuel Production*, ASTM STP 720, L. P. Jackson and C. C. Wright (eds.), American Society for Testing and Materials, pp. 101-128, 1980.

R. D. Giauque, J. P. Fox, and J. W. Smith, *Characterization of Two Core Holes from the Naval Oil Shale Reserve Number 1*, Lawrence Berkeley Laboratory Report LBL-10809, 176 pp., December 1980.

B. M. Jones, R. H. Sakaji, J. P. Fox, and C. G. Daughton, "Removal of Contaminative Constituents from Retort Water: Difficulties with Biotreatment and Potential Applicability of Raw and Processed Shales," *EPA/DOE Oil Shale Wastewater Treatability Workshop*, December 1980 (Lawrence Berkeley Laboratory Report LBL-12124).

J. P. Fox, *Water-Related Impacts of In-Situ Oil Shale Processing*, Lawrence Berkeley Laboratory Report LBL-6300, 327 p., December 1980.

M. Mehran, T. N. Narasimhan, and J. P. Fox, *An Investigation of Dewatering for the Modified In-Situ Retorting Process, Piceance Creek Basin, Colorado*, Lawrence Berkeley Laboratory Report LBL-11819, 105 p., October 1980.

J. P. Fox (ed.) "Oil Shale Research," Chapter from the *Energy and Environment Division Annual Report 1979*, Lawrence Berkeley Laboratory Report LBL-10486, 1980 (author or coauthor of eight articles).

E. Ossio and J. P. Fox, *Anaerobic Biological Treatment of In-Situ Oil Shale Retort Water*, Lawrence Berkeley Laboratory Report LBL-10481, March 1980.

J. P. Fox, F. H. Pearson, M. J. Kland, and P. Persoff, *Hydrologic and Water Quality Effects and Controls for Surface and Underground Coal Mining -- State of Knowledge, Issues, and Research Needs*, Lawrence Berkeley Laboratory Report LBL-11775, 1980.

D. C. Girvin, T. Hadeishi, and J. P. Fox, "Use of Zeeman Atomic Absorption Spectroscopy for the Measurement of Mercury in Oil Shale Offgas," *Proceedings of the Oil Shale Symposium: Sampling, Analysis and Quality Assurance*, U.S. EPA Report EPA-600/9-80-022, March 1979 (Lawrence Berkeley Laboratory Report LBL-8888).

D. S. Farrier, J. P. Fox, and R. E. Poulson, "Interlaboratory, Multimethod Study of an In-Situ Produced Oil Shale Process Water," *Proceedings of the Oil Shale Symposium: Sampling, Analysis and Quality Assurance*, U.S. EPA Report EPA-600/9-80-022, March 1979 (Lawrence Berkeley Laboratory Report LBL-9002).

J. P. Fox, J. C. Evans, J. S. Fruchter, and T. R. Wildeman, "Interlaboratory Study of Elemental Abundances in Raw and Spent Oil Shales," *Proceedings of the Oil Shale Symposium: Sampling, Analysis and Quality Assurance*, U.S. EPA Report EPA-600/9-80-022, March 1979 (Lawrence Berkeley Laboratory Report LBL-8901).

J. P. Fox, "Retort Water Particulates," *Proceedings of the Oil Shale Symposium: Sampling, Analysis and Quality Assurance*, U.S. EPA Report EPA-600/9-80-022, March 1979 (Lawrence Berkeley Laboratory Report LBL-8829).

P. Persoff and J. P. Fox, "Control Strategies for In-Situ Oil Shale Retorts," *Proceedings of the Twelfth Oil Shale Symposium*, Colorado School of Mines Press, Golden, CO, 1979 (Lawrence Berkeley Laboratory Report LBL-9040).

J. P. Fox and D. L. Jackson, "Potential Uses of Spent Shale in the Treatment of Oil Shale Retort Waters," *Proceedings of the DOE Wastewater Workshop*, Washington, D. C., June 14-15, 1979 (Lawrence Berkeley Laboratory Report LBL-9716).

J. P. Fox, K. K. Mason, and J. J. Duvall, "Partitioning of Major, Minor, and Trace Elements during Simulated In-Situ Oil Shale Retorting," *Proceedings of the Twelfth Oil Shale Symposium*, Colorado School of Mines Press, Golden, CO, 1979 (Lawrence Berkeley Laboratory Report LBL-9030).

P. Persoff and J. P. Fox, *Control Strategies for Abandoned In-Situ Oil Shale Retorts*, Lawrence Berkeley Laboratory Report LBL-8780, 106 pp., October 1979.

D. C. Girvin and J. P. Fox, *On-Line Zeeman Atomic Absorption Spectroscopy for Mercury Analysis in Oil Shale Gases*, Environmental Protection Agency Report EPA-600/7-80-130, 95 p., August 1979 (Lawrence Berkeley Laboratory Report LBL-9702).

J. P. Fox, *Water Quality Effects of Leachates from an In-Situ Oil Shale Industry*, Lawrence Berkeley Laboratory Report LBL-8997, 37 pp., April 1979.

J. P. Fox (ed.), "Oil Shale Research," Chapter from the *Energy and Environment Division Annual Report 1978*, Lawrence Berkeley Laboratory Report LBL-9857 August 1979 (author or coauthor of seven articles).

J. P. Fox, P. Persoff, M. M. Moody, and C. J. Sisemore, "A Strategy for the Abandonment of Modified In-Situ Oil Shale Retorts," *Proceedings of the First U.S. DOE Environmental Control Symposium*, CONF-781109, 1978 (Lawrence Berkeley Laboratory Report LBL-6855).

E. Ossio, J. P. Fox, J. F. Thomas, and R. E. Poulson, "Anaerobic Fermentation of Simulated In-Situ Oil Shale Retort Water," *Division of Fuel Chemistry Preprints*, v. 23, no. 2, p. 202-213, 1978 (Lawrence Berkeley Laboratory Report LBL-6855).

J. P. Fox, J. J. Duvall, R. D. McLaughlin, and R. E. Poulson, "Mercury Emissions from a Simulated In-Situ Oil Shale Retort," *Proceedings of the Eleventh Oil Shale Symposium*, Colorado School of Mines Press, Golden, CO, 1978 (Lawrence Berkeley Laboratory Report LBL-7823).

J. P. Fox, R. D. McLaughlin, J. F. Thomas, and R. E. Poulson, "The Partitioning of As, Cd, Cu, Hg, Pb, and Zn during Simulated In-Situ Oil Shale Retorting," *Proceedings of the Tenth Oil Shale Symposium*, Colorado School of Mines Press, Golden, CO, 1977.

Bechtel, Inc., *Treatment and Disposal of Toxic Wastes*, Report Prepared for Santa Ana Watershed Planning Agency, 1975.

Bay Valley Consultants, *Water Quality Control Plan for Sacramento, Sacramento-San Joaquin and San Joaquin Basins,* Parts I and II and Appendices A-E, 750 pp., 1974.